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ABSTRACT

This document contains four papers from a symposium on instructional technology. "Netagogically Speaking, Is IBT (Internet-Based Training) Making the Grade? An Exploration into the Degree-Selected Internet Tutorials Measured Up to Four Design Criteria" (James J. Kirk, Harold Shoemaker) compares 78 information-based and skill-based Internet tutorials and makes recommendations for improvements. "Reliance on High-Technology: A Counterproductive Professional Role Construct Found in Medical Schools" (Joseph M. Merrill, Ronald J. Lorimor, Jack I. Thomby, Carlos Vallbona) finds that students who perceive high-tech medical practice as superior share traits and attitudes inimical to human resource development goals for medicine. "Distance Training System (DTS): A Conceptual Framework" (Maria Hruby Moore) describes DTS as a way of understanding how organizational inputs should be considered in developing efficient and effective training. "Interactive Multimedia Use for Training in Selected Oklahoma City Businesses: A Survey and Case Studies" (Bede Anyanwu, Catherine M. Sleezer) reveals that the greatest ongoing use of interactive multimedia involved CD-ROM, the technology with the lowest cost, expert trainer involvement, and learning curve. (KC)

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Instructional Technology

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**Netagogically Speaking, Is IBT Making the Grade? An Exploration into the Degree
Selected Internet Tutorials Measured Up To Four Design Criteria**

James J. Kirk, Western Carolina University

Harold Shoemaker, University of Tennessee

**Reliance on High-Technology: a Counterproductive Professional Role Construct
Found in Medical Schools**

Joseph M. Merrill, Baylor College of Medicine

Ronald J. Lorimor, Baylor College of Medicine

Jack I. Thornby, Baylor College of Medicine

Carlos Vallbona, Baylor College of Medicine

Distance Training System (DTS): A Conceptual Framework

Maria Hruby Moore, Ohio State University

**Interactive Multimedia Use For Training In Selected Oklahoma City Businesses: A
Survey and Case Studies**

Bede Anyanwu, Oklahoma State University

Catherine M. Sleezer, Oklahoma State University

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Netagogically Speaking, Is IBT Making the Grade? An Exploration into the Degree Selected Internet Tutorials Measured Up To Four Design Criteria

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This exploratory study examined the degree to which 78 easily accessible internet-based-tutorials measured up to selected computer interface and instructional design criteria. Information-based tutorials were compared to skill-based tutorials with respect to their ease of use and opportunity for participants to direct their own learning, interact with instructional materials, and experience a variety of instructional strategies. The findings have implications for the creation, use, and evaluation of internet-based-tutorials.

This research focused on the degree to which internet-based-training (IBT) tutorials met selected design criteria. By combining computer-based education (CBT), hypermedia, and the technologies of the Internet, it is now possible for trainers and educators to deliver instruction anywhere in the world (Caudron, 1996; Hackette, 1994; Stevens, 1996; Wulf, 96). Such internet-based-training can range from short tutorials to full-length college courses. Companies like AT&T, Glaxo, Levi Strauss, Microsoft, Silicon Graphics, and 3M are making use of intranets (company-wide internets) to deliver a wide range of training courses (Cortese, 1996; McKay, 1996).

There are many IBT offerings available. The World Lecture Hall's web site at <http://www.utexas.edu/world/lecture/> displays a large list of educational offerings available over the Internet. The site contains hundreds of links to web pages containing course syllabi, assignments, lecture notes, exams, class calendars, slide shows, and multimedia textbooks. The Web-Based-Training Information Center's web site at <http://www.clark.net/pub/nractive/wbt.html> and the World Internet Training Registry's web site at <http://granite.sentex.net/~witr/> also contain extensive lists of educational programs available over the Internet.

A number of researchers have investigated computer-based instruction. In 1996 Interactive Educational Systems Design, Inc. conducted a meta analysis of 176 educational technology research studies undertaken from 1990 through 1995. They found that educational technology had demonstrated a significant positive effect on learner achievement, self-concept, attitudes about learning, and interactions with teachers. Researchers found IBT's level of effectiveness to be influenced by student population, software design, teacher's role, how students were grouped, and level of student access to the technology. A similar review of instructional technologies studies in the military concluded; (1)IBT can be used to accomplish a wide range of instructional objectives across a variety of settings, (2)IBT is often more effective than traditional training, and (3)IBT is often less costly than other forms of training (Fletcher, 1995).

Due to its brief history, few studies have been conducted on IBT. The few studies that exist are primarily descriptive or anecdotal. For example, the computer magazine Byte (1995) has described a "virtual college" under construction at New York University's School of Continuing Education. Hesser (1995) elaborated on Nova University's use of the Internet in doctoral programs. Pask and Snow (1995) outlined some of the problems encountered while integrating the Internet at two universities. Dereshiwsy (1995) addressed some of the benefits of a graduate course being delivered on-line. A study by Lyons (1885) reported on a group of professionals who preferred learning from internet-based courses as opposed to traditional classroom instruction. Tissue et al. (1996) concluded from his research that IBT was effective in the teaching of chemistry concepts but not effective in the teaching of laboratory skills. Denton and Manus (1995) found that student performance increased in selected public schools where teachers received technology training over

the Internet.

A continuing area of concern about IBT has been the quality of programs that are currently being offered or might be delivered in the future (Ciolek, 1994; Nichols, 1995; Tillman, 1996). A number of writers have begun to suggest criteria for evaluating IBT (Ciolek, 1994; Nichols, 1995; Nielsen, 1996; Reeves and Harmon, 1993; Tillman, 1996). Criteria being offered pertain to the user interface (ways a learner is able to interact with the computer) as well as pedagogical practices (how the instruction is presented to the learner). Examples of interface criteria include ease of use, navigation, screen design, media integration, and overall functionality. Pedagogical dimensions include but are not limited to underlying instructional philosophy/theory, goal orientation, flexibility, motivation, learner control, and user activity.

Research Questions

For the purpose of this investigation, three research questions were posed. They include:

1. Is there a significant difference in the number of information-based versus skills-based tutorials easily accessible on the Internet?
2. To what degree do IBT tutorials; (a) make use of easy to use interfaces and (b) provide participants opportunity to direct their own learning, interact with instructional materials, and experience a variety of instructional strategies?
3. Are there significant differences in information-based versus skills-based tutorials with respect to ease of use and opportunity for participants to direct their own learning, interact with instructional materials, and experience a variety of instructional strategies?

Methodology:

Several of the widely used Internet search engines (i.e., AltaVista, Excite, Infoseek, Lycos, Magellan, Yahoo!) were used to locate easily accessible IBT tutorials on the Internet. "Easily accessible tutorials" were operationally defined as "tutorials which can be located using the standard search engines or are listed in the numerous internet guides and directories created by search engine companies, do not require any special software to view them, and require no fee for their use. The tutorials were observed by three observers with varying levels of Internet experience (i.e., very little, substantial, and extensive experience). All tutorials were viewed on high-end Power Macintosh computers. Observations were made via direct and PP connections to the Internet. Three separate observations were made in terms of the following dimensions: ease of use, opportunity for self-directed learning, provisions for interacting with the learning material, and the variety of instructional strategies employed to teach the content. Implicit in the criteria was a Netagogical model (i.e., a set of guidelines for designing IBT) that called for (1) an easy to use interface and (2) a learning situation where learners can be self-directing, highly interactive with the instructional materials, and experience a variety of instructional strategies.

Observation check sheets was completed for each tutorial. Items on the sheets were extracted from the literature pertaining to the user-friendliness of computer interfaces, self-direct learning, and instructional design (Hannond, 1991; Piskurich, 1993; Reeves and Harmon, 1993). Observations were made and recorded with respect to 12 interface items, 7 self-directing items, 1 interactive item, 1 instructional model item, and 10 instructional strategy items. Tutorials that mainly provided general information on a given topic were classified as "information-based," whereas, tutorials providing detailed step-by-step instructions on how to perform specific tasks were classified as "skills-based."

Data from the observations sheets were checked for consistency. Whenever inconsistencies occurred among the three observers, the most experienced Internet observer revisited the tutorial and recorded his best judgment. Data from the observations were keyed into a statistical database from which descriptive and comparative statistics were computed. Descriptive statistics included; frequency counts, percentages, and means scores for the various variables. Comparative statistics included performing a series of *Chi square tests* to test for significant differences between information-based and skill-based tutorials with respect to numbers, user interfaces, self-directing features, interactivity, and use of selected instructional strategies. A *t test*

was used to test for differences in the variety of instructional strategies between the two types of tutorials. The probability level for determining statistical significance was $p = .05$

Results

The aforementioned Internet search procedures resulted in the collection of 78 web-based tutorials. Providers of the tutorials included educational institutions (39.744%), corporations (33.333%), professional organizations (6.41%), government agencies (2.564%), and individuals (17.949%). The content for a majority of the tutorials' pertained to the Internet and web publishing (71.794%). The remaining tutorials provided instruction on computer software (10.256%), computer technology (6.41%), safety training (6.41%), foreign languages (2.564%), and miscellaneous topics (2.564%). Forty-eight (61.538%) of the tutorials were information-based (i.e., provided general how-to information). Thirty (38.462%) were skilled-based (i.e., gave specific step-by-step directions on how to complete specific tasks).

A one group *Chi-Square* test performed to answer question number one (Is there a significant difference in the number of information-based versus skills-based tutorials easily accessible on the Internet?) produced a *Chi-Square* score of 62.5 with $df = 77$ and $p = .884$. No significant difference in the numbers of the two types of tutorials was discerned.

Frequency tables created to answer question number two (To what degree do IBT tutorials; (a)make use of easy to use interfaces and (b)provide participants opportunity to direct their own learning, interact with instructional materials, and experience a variety of instructional strategies?) are shown in Tables One through Four. Table 1 shows that 4 of the 12 (33%) interface features were employed by 61 of the 78 (78.295%) tutorials. They included an attempt to be accommodating to both Mac and Windows platform users (96%), a means of contacting the provider (88.462%), easy to understand instructions (85.897%), and easily accessible (78.205%).

**Table 1. Number of Tutorials Using
Selected Interface Features
N=78**

Interface Feature	Number Providing	Percent Providing
Accommodating to both Windows & Mac platforms	75	96.153%
Contextual help available	23	29.487%
Download buttons provided for needed software	27	34.615%
Easy accessible	61	78.205%
Easy to understand instructions	67	85.897%
Forward/backward buttons	35	44.872%
General help page	11	14.103%
Means of contacting provider given	69	88.462%
Memory saver or non-graphical version provided	2	2.564%
Search engine for tutorial	8	10.256%
Tutorial site map	4	5.128%
Tutorial menu on each page	10	12.821%

Tables Two, Three and Four provide information on the instructional design features of the tutorials. Table 2 shows that 74 of the 78 (94.872%) tutorials accommodated all 7 (100%) of self-directing features observed. Table 3 reveals that 59 of the 78 (75.641%) tutorials contained from 1-20 links per web page. Table 4 displays data on the 10 instructional strategies used in the tutorials. Sixty-three (80.769%) of the tutorials made use of three strategies. The most commonly used strategies included introductions to the tutorials' content (80.760%), written explanations/directions (100%), and demonstrations or examples (87.179%). The least frequently used strategies included games (1.282%), projects (7.692%), feedback to learners (8.974%), quizzes (8.974%), and post-tests (11.538%).

Table 2. Number of Tutorials Using Self-Directing Features
N=78

Feature	Number Providing	Percent Providing
No prerequisites to participate in the instruction	76	97.436%
Can begin the instruction at any point in the material	74	94.872%
Can go as fast or as slow as one likes	78	100.00%
Can repeat any portion of the instruction at will	78	100.00%
Can discontinue the instruction at any point	78	100.00%
Can select the days of the week in which to learn	78	100.00%
Can select the time of day in which to learn	78	100.00%

Table 3. Average Number of Hyper Links Per Web Page
N=78

Average # clickable Items Per Page	Number Providing	Percent Providing
1-20	59	75.641
21-40	10	12.821
41-60	4	5.128
61-80	3	3.846
81+	2	2.564

Table 4. Number of Tutorials Using Selected Instructional Strategies
N=78

Instructional Strategy	Number Providing	Percent Providing
Introductions to topic	63	80.769%
Written explanations/directions	78	100.0%
Demonstrations and/or examples	68	87.179%
Practice exercises	15	19.231%
Projects	6	7.692%
Game or simulation activities	1	1.282%
Quizzes or periodic tests	7	3.974%
Feedback to learners	7	8.974%
Post tests	9	11.538%
End of tutorial summaries	14	17.949%

Chi Square tests performed to answer question three (Are there significant differences between information-based versus skills-based tutorials with respect to the user-friendliness of their interfaces, opportunity provided for participants to direct their own learning and interact with instructional materials?) revealed one significant difference. Contextual help was available in a significantly greater number of information-based tutorials (*Chi Square* = 8.136, *df* = 1, *p* = .0043). The *Chi Square tests* performed to answer question three (Are there significant differences between information-based versus skills-based tutorials with respect to the use of selected instructional strategies?) revealed one significant difference. Information-based tutorials made significantly greater use of "introductions to the tutorials' content" than did skilled-based tutorials (*Chi Square* = 4.521, *df* = 1, *p* = .0335). The *t test* used to answer the question (Are there significant differences in information-based versus skills-based tutorials with respect the variety of instructional strategies used?) revealed no significant differences. The mean number of strategies used in information-based tutorials was 3.347 and the mean for skilled-based tutorials was 3.586.

Conclusions

Some general conclusions can be drawn regarding the providers, content, and instructional format of readily accessible internet-based tutorials. A majority of the tutorials appear to be provided by educational institutions and private companies. Their major content relates to the Internet and/or web publishing. Tutorials provided by educational institutions tend to focus on understanding the Internet and web publishing. Many of the tutorials provided by private companies teach participants how to use their product (e.g., software) or service (e.g., Internet client provider service). There appears to be a similar number of skill-based versus information-based tutorials available. Furthermore, the computer interfaces and instructional designs of the two types of tutorials appear to be similar.

The information-based tutorials differed with skilled-based tutorials in two respects. Information-based tutorials tended to provide contextual help more frequently and made greater use of introductions to their content. These differences may be due to the size and complexity of the information-based tutorials. Compared to the skill-based tutorials, the information-based tutorials often contained more information spread over a greater number of web pages. Introductory information was needed to understand the scope and organization of the information. The information-based tutorials also included more download pages thus creating a need for more contextual help.

The interfaces of the tutorials appear manageable for learners with web browser navigation experience. The lack of navigation buttons, tutorial menus, and site maps makes it easy for novice Internet users to get lost in the material. Most tutorials properly load on the first attempt without any appreciable time delays (i.e., take less than one minute to load). The help features (general and contextual) seem underdeveloped or are nonexistent. Most tutorials do not provide a non-graphical version of their tutorials. To fully benefit from the tutorials, users must use a computer and a browser capable of handling graphics, including animated GIF images.

As might be expected with various forms of computer-based or computer-aided instruction, the web-based tutorials are generally accommodating to self-directed learning. Learners can choose what, when, and how rapidly they will learn. However, learners are limited in the means (i.e., the instructional/learning strategies) by which they may learn new concepts. The tutorials make wide use of such strategies as descriptive narrative and examples. They make surprising little use of practice exercises and learner projects.

Discussion

When considering the global question posed in the title of this paper (i.e., "Netagogically speaking, is IBT making the grade?") it is easy to arrive at different answers. How highly one grades or rates the instructional design of the tutorials depends in some measure upon; (1) the nature of the criteria being used, (2) the quantitative standards being applied and (3) the type of tutorials being judged. For example, if one considers all 12 interface features listed in Table 1 as equally important criteria for judging the quality of both information-based and skilled-based tutorials, one might give the tutorials a failing grade. Because only 4 of the 12 (33%) interface features were employed by 61 of the 78 (78.295%) tutorials, it can be argued that the tutorials do not have very user-friendly interfaces. However, if one considers such features as download buttons, general help pages, tutorial search engines, tutorial site maps, and tutorial menus on all web pages as inappropriate criteria for evaluating information-based tutorials, one might conclude that information-based tutorials come somewhat closer to making the grade. Thirty-four out of these 48 tutorials (70.833%) incorporated 5 out of 7 (71.428%) of the remaining interface features.

Hyper links (i.e., text or graphic objects that when clicked transport the learner to new information) are common to all web pages. In addition to providing users a means of navigating a web site, they also give participants a means of interacting with the learning materials as they see fit. The number of hyper links per web page can serve as crude measure of the interactivity of a tutorial. A small number of links (e.g., 3-10) afford learners few opportunities to interact with the learning materials. The learner is more passive and has less opportunity to accommodate her/his own learning style. However, a very large number of links (e.g., 60 or more per page) might be overwhelming, confusing, or distracting to learners. Seventy-five percent of the observed tutorials contained 1-20 hyper links per web page. Although there are no hard and fast rules as to the

appropriate number of hyper links that should appear on a page, 1-20 seemed to keep observers actively engaged in the tutorials without being distracting or overwhelming. If 1-20 links is considered an appropriate number of links to appear on tutorial pages, then the observed tutorials might be close to making the grade with respect to their interactivity.

A unique capability of IBT is that it can deliver instruction to adult leaders in their own homes or businesses on their own terms. For 94% of the tutorials, there were no prerequisites to participating in the instruction. Learners could begin the instruction at any point in the material, go as fast or as slow as they desired, repeat any portion of the instruction at will, discontinue the instruction at any point, and select the times and days of the week in which to learn. Based on these criteria, it can be concluded that the tutorials are making the grade with respect to accommodating self-directed learning.

Tutorials may also be graded or rated on the variety of instructional strategies included in their instructional designs. It can be argued that because different strategies are more effective at producing certain learning outcomes and because adults have different learning preferences (Piskurich, 1993), a variety of instructional strategies should be included in any instructional design. Since both types of tutorials make wide use of only three instructional strategies, it can be concluded that they are not making the grade with respect providing learners a variety of instructional strategies. The tutorials need to make greater use of practice activities and learner projects, as well as provide learners more feedback.

The findings of this research are not generalizable to all internet-based tutorials. The observed tutorials included only no-fee, easily accessible tutorials. While these tutorials appear to hold promise in terms of their ability to accommodate self-directed learning, they do not generally measure up to the design criteria specified in the researchers' netagogical model. As the use of internet-based tutorials increases, there is a need to clearly define and label that which constitutes a tutorial. For example, should instructional programs which do not provide any practice or drill activities be considered a "tutorial." There is a need to develop and research internet-based tutorial prototypes. For example, what does a netagogically sound tutorial look like and how effective is it at teaching specific skills over the Internet. Finally, educators and human resource developers must be trained in the creation, appropriate use, and evaluation of internet-based tutorials. Based on the observed tutorials, IBT providers are currently in an "experimental" or "learn as you go" stage.

Summary

This exploratory study looked at the degree to which 78 easily accessible internet-based-tutorials measured up to specific interface and instructional design criteria. Differences in information-based and skilled-based tutorials were examined. The tutorials appeared to accommodate self-directed learning and provide an appropriate level of interactivity with the learning materials. The interfaces of the tutorials did not appear to be particularly user-friendly for novice navigators. Relying mainly on descriptive narrative and examples, the tutorials provide learners a limited number of instructional strategies. Few of the tutorials made use of practice activities or learner projects. Compared to skilled-based tutorials, information-based tutorials provided more contextual help features in their interfaces and provided more introductions to their content in their instructional designs. The current tutorials might best be used with experienced Internet users and supplemented with instructor-made practice activities and feedback. There is a need to clearly define what constitutes a tutorial, develop netagogically sound IBT prototypes, and conduct research on the effectiveness of various prototypes to produced selected learning outcomes.

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Reliance on High-Technology: a Counterproductive Professional Role Construct Found in Medical Schools

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We developed a structural equation model to gain a better understanding of the personalities of medical students who perceive hi-tech medicine as the superior form of medical practice. Intolerance to clinical uncertainty, Machiavellianism, and authoritarianism characterized these students. They also tended to have a negative attributional style toward patients with psychological problems and to choose non-primary care medical careers. Students who perceive hi-tech medicine as a panacea in clinical medicine share personal traits, attitudes toward patients, and career choices that do not advance the nation's stated goals for human resource development in medicine.

Contemporary medicine has three persistent problems: medical care costs too much; too many specialists and too few primary care physicians; and, impaired doctor-patient relationships. Blame for these deficiencies is often attributed to doctors' reliance on high-tech medicine. To explore this problem, we developed a scale to measure medical students' beliefs and feelings about high-tech medicine's role in contemporary medical practice.(1) After five years of experience with this measure, we propose that reliance on high-tech medicine is a professional role construct closely related to personality that not only predicts medical students' choice of specialty but also participates in shaping their attitudes toward patients. The work reported here describes a structural equation model that represents the relationship between medical students' scores on the high-tech medicine scale and their personal traits. This model's contribution to new knowledge in human resource development is shown by the answers we obtained to the following questions. Which medical students score highest on reliance on high-tech medicine? What personal and professional role traits characterize them? What effect does a high score on this scale have on their attitudes toward patient problems? How much influence does reliance on high-tech have in predicting seniors' choice of specialty? How well does a high-tech score separate students who choose a primary care residency from those who enter a non-primary care one?

Methods

Senior medical students (n=1907) from six medical schools (public and private) completed a questionnaire that included measures of reliance on high-tech medicine, authoritarianism, intolerance

to ambiguity, depression, Machiavellianism, sensitivity to patients' behavior, social desirability/self-monitoring, and thanatophobia.(2) Because this study was designed to determine if reliance on high-tech medicine influenced medical students' attitudes toward patients' problems, a scale measuring negative orientation to psychological problems (NPO) was included as part of the survey.(3) Using a Likert-type scale with scores ranging from 1 to 7, respondents indicated the degree to which they agreed or disagreed with each statement. Total scores were calculated by summing the scores of each item and values were reversed for items with opposing response directions. Senior medical students indicated their specialty choice for residency from 10 specialties using the method of paired comparisons. For statistical analysis, a LISREL 8 regression model was estimated to determine the personality traits that predicted reliance on high-tech scores. Latent variables were used for both the dependent and predictor variables in the model. Students with missing values were excluded from the analysis. Alpha coefficients and standard deviations were used to calculate scale error variances that were then entered into the LISREL model. The model was "just identified," i.e., the number of parameters to be estimated was the same as the number of unique elements in the observed covariance matrix. LISREL was also used to test a model that hypothesized that students' reliance on high-tech predicted their attitudes toward patients with psychological problems. Logistic regression was used to estimate the relationship between high-tech scores and seniors' choices of a primary or non-primary care residency.

Results

1. Higher scores on reliance on high-tech medicine were predicted by intolerance to clinical uncertainty ($p<.0001$), Machiavellianism ($p<.0001$), and authoritarianism ($p<.0001$) (Figure 1). The structure of these relationships specified by the LISREL model provided a good statistical fit ($R^2=.53$).
2. Reliance on high-tech medicine together with its three predictors accounted for 44% of the variance associated with medical students' negative orientation to patients with psychological problems.
3. Scores on reliance on high-tech medicine predicted senior medical students' residency choices (Figure 2). The rank order by high-tech scores was: pathology (highest), radiology, anesthesiology, surgical subspecialties, general surgery, ob-gyn, internal medicine, psychiatry, pediatrics, and family medicine (lowest) [$f=11.88$, $p<.0001$].
4. Of the eight personal and professional role traits included in the survey instrument, reliance on high-tech was the best predictor to separate students choosing a primary care career from those choosing a non-primary care one, (chi square=34.3 $p<.0001$)

Figure 1. LISREL Model:
Predictors of Reliance on High-Tech

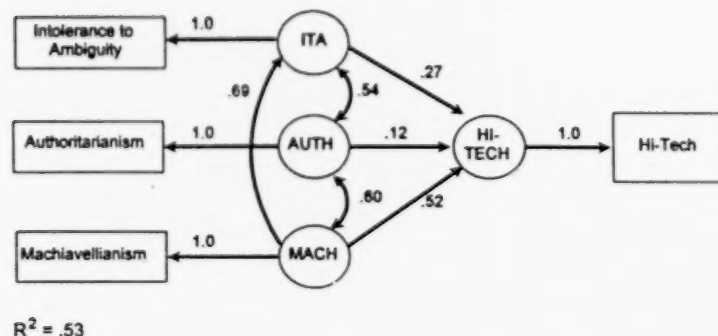
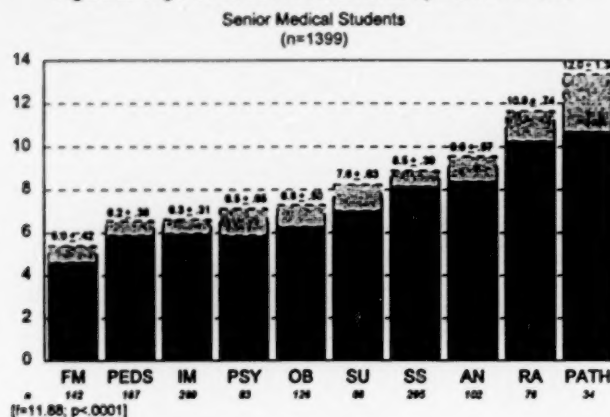


Figure 2: High-Tech Score Increments by Career Choice



Discussion

Previous studies attempting to predict medical students' career choices have been criticized for their weakness in design, inconsistent dependent and independent variables, and the small number of students surveyed.(4) A major objective of this study was to determine how well reliance on high-technology predicted seniors' choice of career. Our results, based on more than 1000 students who chose either a primary or a non-primary care specialty, show that reliance on high-tech medicine is the best measure to identify the student who plans a primary care career rather than a non-primary one.

Medical students who score higher on high-tech medicine, as a group, are less tolerant of uncertainty, more Machiavellian, and more authoritarian than their peers. With the measure we used, being intolerant of uncertainty means that these students dislike caring for patients with doubtful diagnoses, are irritated by inconsistent laboratory reports, and are "turned off" when consultants "are not sure" what is wrong with a patient and when pathologists cannot find the cause of death. It has long been recognized that the person who is intolerant of ambiguity tends to sort choices as either black or white absolutes in order to avoid the reality of grey-zones. High-tech medicine provides numbers which apparently satisfy a need for students who feel uncomfortable caring for patients with ambiguous problems. By contrast, the person who tolerates uncertainty is generally receptive to new ideas, is willing to examine ideas from different perspectives and copes more easily with ambiguous situations.(5)

Machiavellianism also predicted reliance on high-tech medicine. This means that students with higher scores on high-tech tend to value flattering important people, telling people what they want to hear, and acknowledging that it is difficult to get ahead without cutting corners here and there.(6) High-tech medicine's appeal to these students supports the view that "emotional detachment is the underlying requirement to be Machiavellian."(7) Authoritarianism, the third predictor of reliance on high-tech medicine indicates that these students tend to "favor better health care for conscientious and compliant patients and resent tax dollars being spent on caring for patients with self-inflicted problems." Students who favor such differential standards of health care are generally the same ones who favor segregating patients and rationing health care based on their intelligence quotient, lifestyle, or sexual orientation.(8)

Students with a negative orientation toward patients with psychological problems generally scored higher on reliance on high-tech. The marker variables of these two scales illustrate the meaning of this relationship: the student who feels that "the laboratory profile is the most important part of the medical record" is not likely to "look forward to caring for patients with psychological problems." Because most visits to a general medicine clinic are for psychological problems, a

negative orientation toward these patients continues to pose a big problem in meeting the nation's needs in primary health care.(9)

Because non-primary care residencies continue to attract large numbers of medical school graduates, meeting the national goal of more primary care physicians and fewer specialists remains a difficult problem. At the beginning of this decade, it was reported that doctors accounted for 80% of health care costs.(10) Much of the blame for the runaway costs of American health care has been attributed to doctors' use of high-tech medicine.(11-12) An example of this was documented recently by a study of management of acute low back pain. It was found that orthopedists ordered CT or MRI scans three times as often as primary care providers but achieved less patient satisfaction than chiropractors who treated a control group of patients.(13)

To summarize, medical students inclined to rely on high-tech medicine believe that "medicine by the numbers" is the best way for them to practice medicine and believe that if they are technically competent, they can forget about the psychosocial aspects of a patient's illness. The validity of this construct is supported by its demonstrated value in predicting students' choice of career and their attitudes toward patients with psychological problems.

These findings question medical schools' current policies in human resource development. Are existing admissions policies and medical curricula designed to increase the number of primary care physicians? Or, do they still support an education in medicine where the major emphasis is on reliance on high-tech medicine? To identify students who are likely to become future primary care physicians, admission committees should be looking for students who tolerate uncertainty and are non-authoritarian and non-manipulative. By developing a curriculum that de-emphasizes high-tech medicine, medical schools can make careers in primary care more attractive. These proposed changes are suggested as one approach to addressing three major continuing problems of medical care in the United States: too few primary care physicians, an impaired doctor-patient relationship, and excessive costs.

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Distance Training System (DTS): A Conceptual Framework

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This paper proposes a conceptual framework for a Distance Training System (DTS). A DTS is a way of understanding how a variety of organizational inputs should be considered to develop a system of instruction that can efficiently and effectively support individual training outcomes. Given some assumptions and using a systems view, a DTS can be employed by HRD professionals to develop an infrastructure for training that supports the organizational performance of its workforce.

Human Resource Development (HRD) professionals are constantly challenged in today's changing work environment to provide quality training for a diverse, and globally dispersed workforce. In addition, the information age and the high rate of technological change has effected jobs and work processes in many organizations (Chutes, Balthazar, Poston, 1990). At the macro level, changes in technology, employee demographics, and globalization are challenging organizations to find new solutions to help employees receive new knowledge, and to develop the new skills and attitudes required to perform these new jobs. The problems caused by a lack of knowledge, skill, or attitude in this new work environment can seriously impact the organization's overall performance (Rummler and Brache, 1995).

Historically, distance education has provided an efficient solution to instructional problems caused by a separation of teacher and learner by space or time. Distance education allocates limited resources such as teachers, classrooms, and content materials (Wagner, 1990). Although efficient, many researchers in the past have not recognized distance education as an effective learning process. However today, the concept of distance education combined with new communication technologies, offers potentially efficient and effective training solutions to those who facilitate learning in the workplace. The challenge is where to begin.

Distance Education Defined in the Literature

According to Moore (1987), distance education is "any formal approach to learning in which a majority of the instruction occurs while the educator and learner are at a distance from one another." Keegan (1986) indicates that distance education has four defining elements: (1) separation of teacher and learner during the instructional process; (2) influence of an educational organization with evaluation; (3) use of educational media to unite the teacher and student in course content; (4) two-way communication between the teacher and learner. Inherent in the concept of distance education is the planning, organization, and supervision of the system. Also important is the process of designing, developing and delivering the learning experience (Dwyer, 1990). The challenge most cited for a distance education system is that learners are expected to work through designated learning experiences without the immediate and contiguous support of an instructor (Cookson, 1990; Verduin and Clark, 1991). Because the learners are separated from the content and the instructor, they must be highly motivated to gain knowledge and understanding (Garrison, 1988). Likewise, instructional designers need to be concerned with efficiently and effectively providing content based on how the learner perceives, assimilates, interprets, stores and retrieves information (Wagner, 1992).

Moore and Kearsley (1996) from a theoretical and systems perspective, provide the fundamental relationship between the learner, content, and teacher in distance education. In his theory of transactional distance, Moore (1973) defines "distance" as more than just time or

geographic separation of learners and teachers. He also includes a distance of understandings and perceptions that must be overcome by teachers, learners, and the educational organization, if effective, deliberate, planned learning is to occur. Moore's (1991) focus, coming from an adult education perspective, is on the learning process itself. He suggests that the content of the program (structure), and the amount of discussion (dialogue) required for understanding, should drive the type of distance education system developed, and not the medium or the technology. In his system, the learner is assumed to be autonomous.

Theoretical Application of Distance Education to Training and HRD

Performance is the focus of an organizational system. Likewise, a trainee's learning that leads to performance on the job is the desired outcome of any training system. The role of HRD is to support organizational performance. Training is only one solution utilized by HRD professionals to improve performance. Training is applied when a lack of knowledge, skill or attitudes (KSAs) is determined to be the root cause of a performance problem at the job performer level. For an organization, training is often the tool that is the most expensive solution to implement. Training requires employees to leave their jobs, often travel to another location, and many times participate in a learning activity that may not be immediately applicable to performance on their job.

Communication technologies available to trainers today, can transmit the content of any training program via voice and data, allowing the employee to remain at the job site, thus minimizing travel time. Likewise, employees that are self-directed would be able to receive training and engage in learning based on their individual needs. Second, the dialogue required for understanding can be facilitated between trainer (or subject matter expert directly) through interactive communication technologies. The ability to exchange information can make the training session a more effective learning experience for both the trainer and trainee. But, as Moore (1991) warns, the technology should not drive the type of distance education system developed. The content to be learned and the amount of dialogue needed for understanding should be the deciding factors.

Organizational performance should also drive the decision whether or not training at the job performer level is the appropriate solution. If continuous learning is a strategic organizational goal, then a distance training system may be an appropriate infrastructure to consider to support training in the organization. A distance training system (DTS) has the potential for supporting efficient and effective training performance if certain factors are present, and if it is conceptualized thoughtfully. The rest of this paper provides the reader with a basic overview of a DTS.

Problem Statement

One of the critical challenges that Human Resource Development (HRD) professionals face, and will continue to face in the future, is developing employee expertise (Jacobs and Jones, 1995). In general, employees today are expected to be more autonomous (Candy, 1991), while the nature of work is becoming more complex (Howard, 1995). While the HRD literature offers a performance perspective about the learning process, little research has been done on distance training specifically. In terms of the learning process itself, reviews of literature by Leidner and Jarvenpaa (1993) and Alavi et al. (1995) both concur that learning is best accomplished through active involvement. Interactive communication technology offers this potential.

New knowledge, skills, and attitudes are required for employees to adapt to new jobs and processes in a continuously changing organizational environment. If organizations believe in building a competitive advantage through their people (Pfeffer, 1994), then distance education has the capability of providing an infrastructure to do so. Interactive technology supports individual employees' active, continuous learning in the workplace. By using a systems model applied to performance (Jacobs and Jones, 1995; Swanson, 1994), a distance training system (DTS) can be conceptualized for use by HRD practitioners in an organizational context.

The challenges identified from both the literature and the current workplace reality are:

a.) why develop a distance training system? b.) how to develop a distance training system?

A well-planned, integrated distance training system will change the traditional classroom training approach. However, interactive instructional designs can be an overwhelming challenge. This paper is only a starting point. A conceptual model can help simplify this complex topic. The purpose of this paper is to help answer the two questions above by:

- 1.) Identifying the assumptions under which a DTS should be considered
- 2.) Defining a DTS and its associated inputs, processes, and outputs
- 3.) Discussing the implication of a DTS for HRD practitioners and
- 4.) Identifying questions for further scholarly research

Why Develop a DTS?

Organizational Strategy An organization will only develop and implement a DTS framework to improve its overall organizational performance. Strategically, a DTS will only be an efficient and effective solution if the organization's competitive advantage is directly dependent on its employees' knowledge and skills as a collective resource. Recent research in human resource management and organizational performance (Becker and Gerhart, 1996; Barney, 1995, 1991) suggests that a "resource-based" view of the firm is a strategy that focuses on developing complex systems that support people. A firm will achieve a competitive advantage since these systems are difficult to reproduce by their competitors. Systems that leverage technology to support individual, team and organizational performance will be difficult and costly to duplicate.

A DTS should be viewed as an infrastructure for a training system. An organization that already has a training system in place should analyze, design, develop, implement, and evaluate a DTS through its HRD function. A DTS should be considered as a solution when an organizational performance problem (gap) has been determined to be caused collectively by employees' lack of knowledge, skill, or attitudes related to their jobs. A DTS would be especially effective when an organization continually has new processes, products or services that are being introduced quickly to the market. The solutions offered by a DTS are technical, managerial, or awareness training brought directly to the employee on a just-in-time basis.

Assumptions The organization considering a DTS must have certain characteristics for this tool to be an option for providing employees with new knowledge, skills or attitudes. The four elements that appear to be critical to developing a DTS are:

- (1) a large number of employees that will require training (# employees),
- (2) the knowledge of a subject matter expert is a significant but limited resource requirement for developing employee expertise (instructional content),
- (3) the timeliness of new knowledge, skills or attitudes required is critical to performance on the job (speed to market),
- (4) the type of training required (managerial, technical, or awareness) determines the amount discussion required for employee understanding (dialogue)

Strategically, an organization should consider these factors to determine if a distance training system is appropriate.

How to Develop a DTS?

A Systems Approach as a Conceptual Framework for a DTS. A systems approach as defined by Sherman (1981) is "essentially a way of thinking about a problem which is complex and must be brought under control and provides a means for conceptualizing functions and activities in order to keep the managed enterprise moving toward stated goals." (p.24) The systems approach takes a holistic view of the complex transaction. A DTS is based on the view of instruction as a systematic process where each input or component part is important to a successful learning outcome. Jacobs and Jones (1995) with their view of structured on-the-job training as both a system and a process provide the framework for the DTS. Swanson (1994) also developed a systems model of performance improvement that contributed to the DTS development.

A system is defined by Dick and Carey (1990) as a "set of interrelated parts, all of which work together toward a defined goal. The parts of the system depend on each other for input and output, and the entire system uses feedback to determine if its desired goal has been reached." (p.2-3) A DTS is a concept that brings together all the inputs required to construct a frame for an organizational training structure within a performance paradigm.

Definition of a Distance Training System (DTS) A DTS is a framework, or conceptual way HRD professionals can view distance training inputs, process, output, feedback and situational context variables. A DTS is defined in this article as:

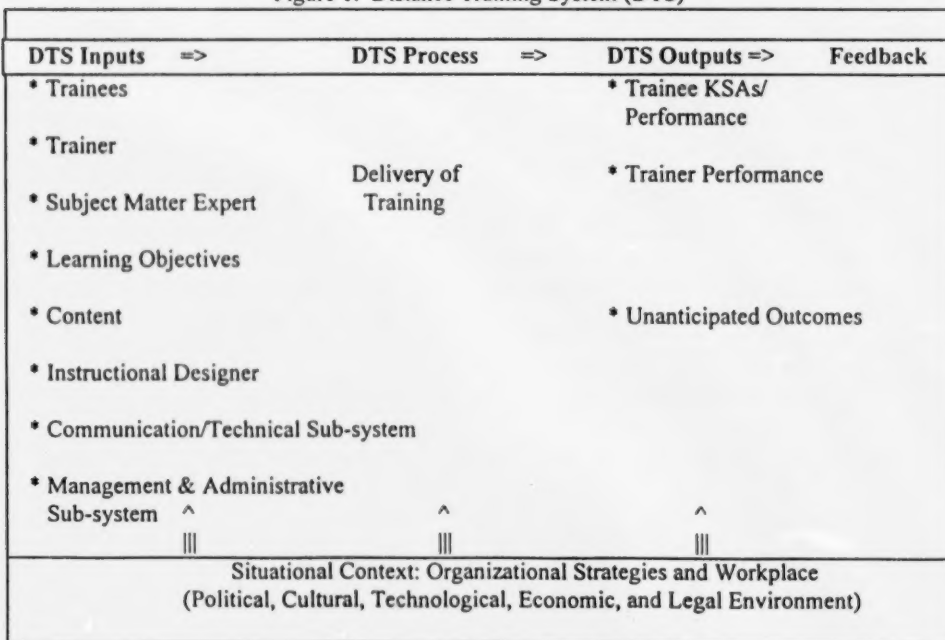
a set of interrelated inputs (trainers, trainees, content, learning objectives, subject matter experts, instructional designers, a communications/technical sub-system, and a management/administrative sub-systems) all of which work together in a training delivery process that results in a training outcome that leads to a performance goal. Coordination among the inputs is necessary to achieve planned learning objectives. The entire system uses feedback and situational context variables to determine if performance on the job has been achieved.

A DTS is similar to "teletraining" except that it is more expansive in its view within an organizational context. Chutes, Balthazar, and Poston (1990) define teletraining as "a complete system that integrates the planning, delivery, and management of training by using a combination of information technology and teleconferencing services." (P.260) Conceptually, a DTS considers these points, plus the political, cultural, economic, technological, and legal environmental variables. A feedback sub-system is also introduced with the DTS model.

An analysis and value of input variables should be calculated as well as the expected value of the outputs, before a DTS investment. An evaluation of the employees' performance on the job, after distance training, must be also be designed into the larger performance system.

Unanticipated outcomes are expected from this system. However, the purpose of the DTS is specifically to provide a system of instruction that results in trainee knowledge, skill, and/or attitudes (KSAs) and trainer performance. Figure 1 outlines the components of the DTS.

Figure 1: Distance Training System (DTS)



Definition of DTS Inputs, Processes, Outputs, Feedback and Situational Context

Inputs Trainee A trainee is a person employed by the organization to perform some specific job, usually with direct impact on a product or service that goes to the customer. All trainees are different in terms their level of KSAs, needs, learning styles, levels of motivation, and experiences.

Trainer A trainer is a person with specialized knowledge and skill to plan, design, deliver, and evaluate instruction. Trainers usually possess skills for delivery of training modules.

Subject Matter Expert (SME) A subject matter expert is the organization's staff person, or an outside consultant with specialized knowledge of a product, service or process.

Learning Objectives Learning objectives are the specific goals of the training that lead to some performance on the job. They outline what specific knowledge or skill is required by the employee to perform a task based on job analysis.

Content The content is the actual knowledge or skill being conveyed. The "what" or message that is to be experienced by the trainee.

Instructional Designer An instructional designer is skilled in how to design instruction and match the training content and learning objectives to the appropriate medium.

Communication/Technology Sub-system The communication technology sub-system is the communications software, hardware, and technical expertise required during training to enhance the instruction between the trainer and the trainee. There are two components of a communication sub-system, a "process" or software component, and a "product" or hardware component. Both require technical expertise to operate effectively. The process component is concerned with "how" the training is experienced by the trainees. The product component is the physical equipment that facilitates the type of communication such as a one-way or two-way transmission of voice or data or both.

Note: The dialogue between the trainer and trainee can be enhanced by communication technology. Three (3) generations of two way communications identified by Garrison (1985) are correspondence, teleconferencing, and microprocessor based. Media is viewed as a subset of hardware that distributes the information (referred to as a delivery mode). Along with the traditional print media, Chutes (1991) provides three delivery media used in teletraining: audio, audiographic, and video.

Management and Administration Sub-system The management and administration sub-system include the managerial and administrative support people who are responsible to make sure all the DTS inputs are organized and supported. Management must work with the various inputs to coordinate the development of the DTS. Management is responsible to understand the organization's strategies and the environment in which the organization operates. Management must then coordinate the various inputs and create the DTS. Management (HRD function) determines if a DTS is the appropriate solution that support's the organization's strategies. Likewise, management must set up administrative support for maintaining the ongoing operation of a DTS. The administrative support would schedule trainees, coordinate meetings for course development, and other duties that keep the DTS operational. This includes support for the trainees, trainers, subject matter experts, and the communication sub-system.

Process Delivery of Training The delivery of the training is the actual transaction between the trainer, trainee, and content (delivery of the training module). Delivery combines all the inputs into a training module transmitted by the trainer. Considerations about the actual job and the amount of dialogue required for understanding by the trainee has already been considered in the planning and design of the training module by an instructional designer. Delivery is the result of how the trainer conveys the training module message to the trainee(s). The trainer can control the delivery of the instruction; however, how the trainee receives new technical, awareness, or managerial training is a function of the learner. How training is delivered should be a function of the DTS inputs that maximize trainer and trainee performance.

Outputs Trainee KSAs/Performance The trainee's performance is the degree to which the employee can take action or carry out a learning task based on the goals and objectives of the training. The gaining of new knowledge, skill or attitudes (KSAs) is usually measured by some test or assessment instrument after the training event.

Trainer Performance The degree to which the DTS designed training program was delivered by the trainer as evaluated by the trainee's performance. How well the trainer knows the instructional objectives, job content, uses the subject matter expert, conveys the content, matches the appropriate communications technologies to the trainees, etc. will increase or decrease the effectiveness of the training transaction.

Other Unanticipated Outcomes Other by-products of training that are not specifically intended by the DTS, but are potential by-products. For example, a "culture of expertise" (Jacobs and Jones, 1995).

Feedback is collected from a system set up so that management can gain information about individual and collective organizational performance. A feedback system usually allows for direct customer feedback data to be collected and analyzed by management. This feedback can be used to assess trainees gaps in performance on the actual job. For example, performance appraisal data is collected by management and provided to both the trainee and trainer as a source to aid in improving performance.

Situational context is a sub-system composed of the organization's strategies and its workplace environment. How the organization interacts with the larger macro environment of political, cultural, technological, economic, and legal factors will influence DTS inputs, process, and outcomes. Every organization has a business strategy. Chandler (1962) defines strategy as "the basic long-term goals and objectives of the enterprise which leads to the adoption of courses of action and allocation of resources necessary for carrying out these goals." (p.13) Strategy involves matching organizational skills and resources with constraints and opportunities in the environment. Analysis of the corporate strategy and the skill level of employees must be assessed to determine if the DTS is an appropriate tool to be used to address performance problems.

Implications of a DTS for HRD and Questions for Future Research

A Distance Training System (DTS) provides a way for HRD professionals to understand how the concept of "distance education" can be adapted to training and extended to performance in an organizational setting. This paper provides the assumptions for why a DTS should be considered by an organization. If organizational performance is dependent on its people continuously learning new knowledge and developing new skills and attitudes, then a DTS may be an appropriate and strategic solution. Next, a DTS was outlined to provide a framework for thinking about how the system should be constructed. How a DTS is ultimately operationalized will depend on how the inputs are arranged and implemented by HRD to meet the training needs of employees based on individual gaps in performance based on a lack of knowledge, skill or attitudes.

To conclude, a number of research questions have been generated to serve as a basis for further inquiry and research into the effectiveness of a DTS.

- a. What kinds of trainees excel using a distance training system? What motivational, cognitive/learning style, or psychological characteristics differentiate trainee performance using a DTS?
- b. What kinds of trainers would perform well in a DTS environment? Are new skills required by those who deliver content in this communicative/technical environment? What are the new skills required by instructional designers to assess and use all the new computer media and communication technologies available?

- c. What is the cost-benefit of certain types of communication technologies over traditional methods of training? What is the break-even point when investing in DTS and the expected ROI? How should it be measured?
- d. What types of communication technologies are best matched with desired training outcomes? Does the amount of dialogue limit understanding? How does the amount of dialogue effect individual trainee performance or overall organizational performance? Does a DTS alter the training content? How will trainees react to the technologies that require self-direction and motivate employees to learn?
- e. How does the organizational strategy or situational characteristics support a DTS? Do organizations that have a DTS, perform better than a similar organization that does not utilize this tool? What are the best practices in managing and administering a DTS. Will a DTS become a source of sustained competitive advantage, or is it a fad?
- f. What are the implications of a DTS on the role of HRD as a strategic function in the organization? Does a DTS support employees in a way that creates a culture of expertise? What impact does a DTS have on organizational structure and how work gets done?

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Interactive Multimedia Use For Training In Selected Oklahoma City Businesses: A Survey and Case Studies

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Human Resource Development (HRD) can have difficulty separating the fact from fiction related to interactive multimedia (IM). Survey was used to gain an understanding of how HRD professionals, trainers, and other business executives in profit oriented organizations in the Oklahoma City area viewed interactive multimedia (IM) use for training within their organizations. Subsequently, case study methodology was used to obtain in-depth descriptive information of how and why interactive multimedia was actually used for training within specific selected organizations. The study revealed the actual on-going use of IM was greatest in the lowest cost technology CD-ROM. This technology also has the lowest expert trainer involvement and learning curve. The study also revealed the non categorization of IM as a training/non training tool within organizations.

A traditional assumption of formal training has been that multiple learners move through a body of course material in unison, usually guided by a single training expert. Unfortunately, this approach lacks flexibility. The underlying assumption is not always realistic: a large group of learners who can begin acquiring the content at the same point in time, work at the same pace, and finish the training program with the same knowledge and skills. Similarly, traditional training techniques required the availability of competent trainers. In many organizations, and for many learners, when these conditions could not be met, training needs remained unfulfilled (Woollard & Morrison, 1995). With interactive multimedia (IM), training needs can be met, thereby increasing the flexibility of training and the speed with which training content can be put to use. IM can also increase the speed of knowledge dissemination by decreasing the amount of time required by individuals to learn new material (Dennis, 1994).

Related Literature

Trainers have historically used such devices as slide projectors, textbooks, videocassette recorders, film projectors, and other media to present instruction. Each of these device provides specific benefits for presenting certain types of information (Copeland, 1992). However, with IM, these benefits can be integrated, thereby, reducing the amount of time learners require to acquire training content (Charp, 1995). Advocates such as Dennis (1994), Gayeski (1993), Gery (1991), Pina and Savenye (1992), and Strong (1992) have expounded on how IM technology is causing organizations to change from the traditional ways of conducting business.

Many advocates believe organizations that seize the opportunities inherent in the IM revolution will capture important competitive advantages, while those organizations that lag behind will be forced to scramble in a race to catch up or be forced out of business. To meet today's business challenges, managers are adjusting their business practices, changing their mental models (Senge, 1990), and are keeping abreast of new developments in performance and related technologies (Piskurich, 1993; Tapscott & Caston, 1993). Adopting novel and related

technologies in the early stages of the technology lifecycle is one way for organizations to compete in the global economy. It limits the risk of obsolescence due to non support by vendors and courseware producers, and the loss of benefits that could have been obtained had the technology been used earlier (Braden, DeWeaver, & Gillespie, 1991).

However, reviewing the projected use of IM highlights the tension between the promise and the reality for the technology use in business and industry training. A study conducted by Oz and White (1993) on IM use among corporate organizations in America revealed that while IM is a rapidly growing field, training still has a small share of the market. Similarly, surveys by Filipczak (1992) and *Training Magazine* (1993, 1995) showed only small increases in the use of IM technology for training in corporate American organizations, with 17% use in 1992, 20% in 1993, and 27% in 1995. Some reasons for the slow adoption of this training technology given its potential benefits have been identified. For example, Gayeski (1993) reasoned that most organizations, trainers, and human resource development professionals do not understand how this technology might be applied to their work.

Problem Statement

Interactive multimedia technology popularity seems matched only by its mystique. The technology is being touted as the latest and greatest training tool ever used in organizations (Gayeski, 1993), but the adoption rate of the technology is slow and low (Anderson, 1995; Filipczak, 1992; Oz & White, 1993). Further, many HRD professionals, trainers, and other business executives are interested but unsure about how their training needs can be met with IM (Amthor, 1992-1993). To make sound decisions, HRD professionals, trainers, and other business executives need systematically gathered information about how IM technology is actually used for training within organizational contexts.

Research Objectives

The research objectives of the study were two-fold. The first objective was to gain an understanding on how HRD professionals, trainers, and other business executives in 271 Oklahoma City profit-oriented organizations viewed IM use for training in their respective organizations. The second objective was to obtain in-depth descriptive information of how and why IM was used for training in specific selected organizations.

Methodology

The study methodology included survey and case study. Meeting the first objective involved surveying HRD professionals, trainers, and other business executives in 271 Oklahoma City profit oriented organizations. The survey included: a) an examination of the specific types of media use, b) organizational and training department's perceptions of IM use, and c) changes caused by using the media. The survey instrument was reviewed by experts, pilot tested, and then administered using the strategy identified by Babbie (1973, 1986).

The survey instrument replicated items from the American Society for Training and Development (ASTD) (1993) National HRD Executive Survey on Performance Support and Interactive Media. The instrument was modified to include information about the organizations' demographics, Compact Disc Interactive, Digital Video Interactive, Laser Disc Read-Only-Memory, and Virtual Reality. Other modifications included the exclusion of performance support as a topic and the replacement of 1995 and 2000 with 1997 and 2002 respectively. Eighty five organizations provided useful information.

The second objective was to obtain in-depth descriptive information of how and why IM was used for training within specific organization contexts. Meeting the second objective

involved using structured interviews in seven purposively-selected organizations. The interview guide was reviewed by experts for face and content validity and administered using the protocols identified by Yin (1989, 1993).

The interview guide included questions such as: a) how organizations were using interactive multimedia for training (performance improvement/support), b) how training was available using interactive multimedia, c) how interactive multimedia was available (i.e., on-site, off-site, out-source), d) how was interactive multimedia accessible, and e) reason(s) for interactive multimedia use. Seven organizations provided beneficial information.

Results and Findings

The survey data provided information about the use of IM techniques, the training departments' roles, the evaluation of IM, the future of IM, and the obstacles to IM implementation. Some highlights of the survey data included the following:

- 1) About half of the organizations have used or are using IM, about 30% are using the technology in an ongoing basis, and about 13% have used the technology as a test or pilot, b) all the IM activities in the have/are being used category were accounted for by 61% of the respondent organizations, and c) IM usage varied across techniques: CD-ROM was used in 68.2% while none of the other technologies was used by more than 20% of the organizations.
- 2) Training department led the IM effort 26% of the time. The role of the training department as a leader varied across specific IM techniques. For example, 60% of the Distance Learning activities were led by the training department; however, less than 20% of CD-ROM use was led by the training department. Further, none of the activities in EPSS, Laser Disc ROM, and Virtual Reality was reported to have been led by the training department.
- 3) IM was not often evaluated or measured. However, when it was accessed, a variety of measures were used. Some examples included formal and informal feedback evaluations; training evaluations; improvement in employee skills; surveys and research; increase in sales and bottom line; conferences; and improvement in productivity.
- 4) In identifying IM trends in the next three to five years provided varied answers. The most frequent response relative to the organizations' IM use was employee training. Other responses focused on communication and information gathering.

The case studies data provided information of how and why IM was used for training within the specific selected-organizations. The case studies were summarized as follows: a) the individuals interviewed knew how IM was used within their organizations to fulfill their training needs and b) organizations were using IM technology was in response to changes in the business contexts. Specifically, organizations were using IM for formal training, on the job training, retraining, and cross training, and education. The case studies data also revealed various reasons why IM was used. Some of these reasons included competition both locally and globally, proactive (i.e., being ahead of the competition), business necessity, technology driven, and employee driven.

The study revealed that reports of IM use were neither all hype nor all truth. The study showed that organizations were using the technology at various levels and ways to respond to a dynamic external environment. The study also revealed that some HRD professionals lacked knowledge on the use of IM technology for training.

Implications and Future Research

This study identified potential reasons for the slow and low adoption of IM technology for training. From the systems theory perspective, the lack of knowledge could result in the HRD professionals and trainers inability to convince organization decision makers of the benefits of this technology for training, thereby, stifling the organizations from gaining the benefits of adopting novel technologies in the early technology lifecycle.

This study provided information about how IM technology was used by one population of HRD professionals, trainers, and other business executives. The level of IM usage for training when integrated with the identification of lack of knowledge as a barrier to IM implementation challenges academicians who serve the target population to integrate knowledge and skills of IM into HRD courses. Additionally, it challenges HRD professionals to consider how they compare with others in using this technology for training and other business related activities. The results should not be generalized beyond the population studied and more research is needed in other populations. The information obtained can be applied to expand theories and models of IM use. Understanding the diversity of HRD professionals and trainers IM technology use across organizations can result in theories and models that better reflect actual practice.

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